Title:

Hatzfeld, J. J., Hildebrandt, G., Maddry, J. K., Rodriquez Jr, USAF, D., Bridges, E., Ritter, A. C., ... & Cap, A. P. (2021). Top 10 Research Priorities for US Military En Route Combat Casualty Care. *Military Medicine*, *186*(3-4), e359-e365.

Authors:

Maj William T Davis, USAF, MC; Lt Col Cubby L. Gardner, USAF, NC; Shelia C Savell, PhD, RN; Richard Stefanski; Maj Patrick C Ng, USAF, MC

We thank the research subcommittee and Committee on En Route Combat Critical Care (CoERCCC) members who developed the top 10 research priorities for ERCCC published in the March/April 2021 issue of Military Medicine based on discussions between 2016-2020. Since that time, strategic shifts and changes in combat operations have resulted in renewed focus on Arctic environments, Multi-Domain Operations (MDO), and preparation for large scale combat operations (LSCO) in denied environments have implications to the research priorities for en route care (ERC). Specifically, future mission projections with lack of air superiority and inability to perform on demand aeromedical evacuations will challenge scalability in resource constrained environments with prolonged evacuation times in novel environmental conditions. Operational medicine leaders have called for the en route care (ERC) community to proactively identify and address ERC system needs in a denied environment with large casualty volumes to decrease lives lost in early stages of future conflicts. Upon review of the top 10 priorities published in Military Medicine, these core priorities remain relevant in this changing environment. In the authors' opinion, both research for knowledge and research for materiel should be considered through the perspective of future operating environment needs to address each of the 10 priorities identified by the CoERCCC. The intent of this communication is to provide a few examples of translating the ERC research priorities specifically to address

challenges anticipated with: (1) prolonged evacuation times, (2) operations in extreme cold environments, (3) ERC scalability for large volumes of wounded, ill, and injured (WII) and (4) interoperability between personnel and equipment across joint ERC.

The impact of an extreme cold operating environment must be considered for the top 10 CoERCCC research priorities. Optimizing ERC in the extreme cold temperatures will require research, development, test, and evaluation efforts for knowledge and materiel solutions to improve human and equipment performance for ERC in these conditions. Specific application of the ERC research priorities would include patient monitoring devices which are operable in extreme cold temperatures, hypothermia prevention devices to maintain normothermia in extreme cold temperatures, transport physiology for impact of vibration and hypobaria in an extreme cold environment, and challenges for unmanned transport in extreme cold temperatures. The Initial Capabilities Document (ICD) for Combat Casualty Care (C3) Support for Future Operations states the need for interoperable equipment across the joint en route care spectrum. The 2021 CoERCCC meeting highlighted the importance of this capability in extreme cold environments as current practice during ERC transitions involves completely exchanging monitoring equipment between different US care teams. In the Arctic environment, this interoperability gap would cause patient harm due to increased risk of hypothermia from breaking the integrity of hypothermia prevention devices. This is a specific example where the needs of the future operating environment place an urgent and timely emphasis on identified ERC research priorities (Monitoring, #3).

The Joint DOTmLPF-P Change Recommendation (DCR) for Combat Casualty Care (C3) Support for Future Operations stresses the need to consider prolonged evacuation times in future operating environments. The authors call for RDT&E efforts to evaluate the impact of

prolonged evacuation on injury patterns, required ERC personnel skillsets, and impact on clinical outcomes. Operational leadership has stressed that the patient population in large volume casualty events differs from the small casualty numbers of recent conflicts, as the nature of the event itself causes hours of delays in care other than first responder efforts. Researchers must be innovative to address the novel ERC capabilities required to address this broad need to optimize transport capabilities following prolonged combat casualty care. The ERC priorities of monitoring, patient handoffs, transport physiology and DCR/DCS timing should be considered specifically for patients who require prolonged evacuation.

An additional consideration for future operating environments is scalability of ERC capabilities to meet the needs of large volumes of WII in contested, degraded environments. The Joint DOTmLPF-P Change Recommendation (DCR) for Combat Casualty Care (C3) Support for Future Operations highlights the need to consider both ERC provider skillsets as well as the required skillsets for non-medical personnel to meet ERC needs in this environment. This is addressed in the top 10 ERC research priorities in the need for clinical decision support to serve as a force multiplier to expand capabilities of medical personnel in future environments. The ERC research priorities also highlight the far target of unmanned transport to meet these needs. Furthermore, leveraging technology to assist with documentation, monitoring, and patient hand offs amongst other priorities previously identified should be highlighted. The authors of this letter suggest that RDT&E to address the needs of the future operating environments must also prioritize the training needs of joint en route care medical and non-medical personnel for near and mid-term targets to meet ERC needs until technology enables autonomous transport systems.

In summary, the work of the ERC leaders identifying top research priorities remains relevant despite the changing strategic environment. These priorities must be considered in

terms of the needs of the future operating environment with specific emphasis on: (1) prolonged evacuation times, (2) operations in extreme cold environments, (3) ERC scalability for large volumes of WII, and (4) interoperability between personnel and equipment across joint ERC.

References available from the authors.

Disclaimer: The views expressed are those of the authors and do not reflect the official views or policy of the Department of Defense or its Components.